

15th Annual
**Student
Research
Forum**

April 21, 2006

Centenary

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15th Annual
**Student
Research
Forum**

April 21, 2006

Posters

Carlile Auditorium
(Mickle Hall first floor)
12:15 – 1:00 PM

Social Sciences

Kilpatrick Auditorium
(Smith Building)
1:25 – 4:10 PM

Natural Sciences

Carlile Auditorium
(Mickle Hall first floor)
1:45 – 4:30 PM

Humanities

Hurley School of Music
(Room 201)
2:05 – 3:20 PM

15th Annual
**Student
Research
Forum**

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CENTENARY BOOK BAZAAR

DR. DARREL COLSON

PROVOST AND DEAN OF THE COLLEGE

JUDGES

DR. DAVID BIELER *Associate Professor of Geology*
DR. CHRISTOPHER CIOCCHETTI . . . *Assistant Professor of Philosophy*
DR. SCOTT CHIRHART *Assistant Professor of Biology*
DR. LOREN DEMERATH *Associate Professor of Sociology*
DR. ROBERT PRICKETT *Instructor in Education*
DR. ROSS SMITH *Associate Professor of Music*

FROM THE DIRECTOR

The annual Student Research Forum provides Centenary students an opportunity to showcase their talents and experiences. They are to be commended for their efforts and quality work.

Thank you research participants and advisers for doing the projects and presenting your work in this forum. This is one of our largest forums.

Judges, thank you for your time and effort.

Special thanks is expressed to the Centenary Book Bazaar for its financial support. We greatly appreciate it!

Sincere thanks is given to the Provost and Dean of Centenary, DR. DARREL COLSON, for all of his financial support, encouragement, selection of judges, etc.

Thank you Ms. JEANNIE CLEMENTS, Office of the Provost, and Ms. PEGGY COOPER, Office of Public Relations/Publications, for all of your work on planning the forum, designing/producing the brochure and the T-shirts, room arrangements, refreshments, etc. You are the best and much of our success is credited to you!

DR. MATTHEW WEEKS, *Director*
15th Annual Student Research Forum

SCHEDULE

POSTER PRESENTATIONS

Mickle Hall (first floor) 12:15 P.M. til 1:00 P.M.

Adams, Jessica	Biology
Reynolds, Julia & Kelly Waterhouse	Biology
Kennedy, Jillian & Elizabeth Wilson	Biology
Requena, Lisa	Biology
Atchison, Jennifer	Neuroscience
Thompson, Beth	Biology
Johnson, Talicia & Cheynita Metoyer	Biology

SOCIAL SCIENCES

Kilpatrick Auditorium

1:25 P.M.	Provost Darrel Colson	Introduction/Welcome
1:30 P.M.	Surie, Diya	Sociology
1:40 P.M.	LeBato, Megan	Sociology
1:50 P.M.	Noon, Mary	Sociology
2:00 P.M.	Argue, Emily	Business
2:10 P.M.	Wright, Jonathon	Accounting
2:20 P.M.	Frost, Lauren	Business
2:30 P.M.	Lerchie, Scott	Finance

BREAK

2:40 – 3:00 P.M.

SOCIAL SCIENCES *(continued)*

Kilpatrick Auditorium

3:00 P.M.	Scarlato, Thomas	Economics
3:10 P.M.	Evans, Emily	Finance
3:20 P.M.	Scarlato, Thomas	Economics
3:30 P.M.	Lehane, Sara	Psychology
3:40 P.M.	Lerchie, Megan	Psychology
3:50 P.M.	Junot, Ashlie	Psychology
4:00 P.M.	Goodwin, Ryan	Political Science
4:10 P.M.	Stojanov, Eftim	Political Science

SCHEDULE

NATURAL SCIENCES

Carlile Auditorium

1:45 P.M.	Provost Darrel Colson	Introduction/Welcome
1:50 P.M.	Brown, Scott	Physics
2:00 P.M.	Lawrence, April	Physics
2:10 P.M.	Howes, Adam	Biophysics
2:20 P.M.	Waits, Shelley	Biochemistry
2:30 P.M.	Broussard, Josh	Biology
2:40 P.M.	Rome, Courtney	Biology
2:50 P.M.	McNamara, Michelle & Travis Reece	Biology

BREAK

3:00 – 3:20 P.M.

NATURAL SCIENCES *(continued)*

Carlile Auditorium

3:20 P.M.	O'Brien, Rebecca	Biology
3:30 P.M.	Boling, Susan	Biology
3:40 P.M.	O'Brien, Rebecca	Biology
3:50 P.M.	Martin, Brett	Biology
4:10 P.M.	Bjerke, Brittany	Biology
4:30 P.M.	Thompson, Beth	Biology

HUMANITIES

Hurley 201

2:05 P.M.	Provost Darrel Colson	Introduction/Welcome
2:10 P.M.	Larsen, Amy	English
2:20 P.M.	Lopez, Kacie	Religious Studies
2:30 P.M.	Lacy, Courtney	Religious Studies
2:40 P.M.	Hills, Darrius	Religious Studies
2:50 P.M.	Monette, Amber	Religious Studies
3:00 P.M.	Schild, Weston	Religious Studies
3:20 P.M.	Hennigan, Sean	Religious Studies

POSTERS

*Note: *Denotes presenter(s) for multi-author works*

EFFECTS OF MIXTURES OF CHEMICALS ON MACROPHAGES

Jessica Adams

Department of Cellular Biology and Anatomy
Louisiana State University Health Sciences Center

RESEARCH ADVISERS

Dr. Cynthia Brame

Dr. Stephen B. Pruett

Organisms are rarely exposed to individual environmental pollutants, yet limited research has been done on the adverse effects of chemical mixtures on immune function. Previous studies suggest, that the insecticide dieldrin and the herbicide atrazine act together in a greater than additive manner in mice to suppress IL-6 production, but the mechanism remains unknown. The short-term goal of this project was to determine the effects of dieldrin and atrazine on polyinosinic polycytidylic acid induced IL-6 protein production in RAW 246.7 cells. We hypothesize that direct and indirect effects of dieldrin and atrazine would inhibit IL-6 production *in vivo* to a greater extent in combination than either compound alone, and this inhibition can be modeled in a RAW 264.7 *in vitro* system. RAW 264.7 cells were incubated in serial concentrations of atrazine and dieldrin, both alone and combined, for 2 hours. An ELISA was used to assay IL-6 production. In this system, results indicate that the combined chemicals increase rather than decrease IL-6 at most concentrations. Therefore, the *in vitro* model lacks the ability to accurately predict the *in vivo* results.

DOES DELETION OF A LARGE GLUTAMINE/ALANINE-RICH SEQUENCE ALTER FUNCTION OR LOCALIZATION OF YEAST CASEIN KINASE 2?

Julia Reynolds and Kelly Waterhouse

Department of Biology
Centenary College of Louisiana

RESEARCH ADVISERS

Dr. Lucy Robinson

Dr. Cynthia J. Brame

Yeast casein kinase 2 (YCK2) is a member of the casein kinase 1 family of protein kinases. This family of protein kinases

is thought to be important in glucose metabolism, synaptic transmission, receptor signaling, circadian rhythm, DNA repair, nuclear import, and cell division. In yeast, YCK activity is essential for cell division and colony formation. Yck2 has two important functional domains: the amino-terminal kinase domain and the carboxy-terminal domain, which is important for localization and, potentially, protein-protein interactions. We investigated the importance of a glutamine/alanine-rich segment of the carboxyl-terminus because we hypothesize that this region is important for protein-protein interaction and thus for Yck2 function and localization. Using site-directed mutagenesis, we deleted this segment, producing a green fluorescent protein-tagged mutant YCK2 allele that we cloned in *E. coli* and expressed in yeast for analysis of function and localization.

EFFECTS OF DELETION OF
FOUR CONSECUTIVE HISTIDINES
ON THE FUNCTION AND LOCALIZATION
OF YEAST CASEIN KINASE 2

Jillian Kennedy and Elizabeth Wilson
Department of Biology
Centenary College of Louisiana

RESEARCH ADVISERS

Dr. Lucy Robinson
Dr. Cynthia J. Brame

Yeast casein kinase 2 (Yck2) is a membrane protein that is essential for cell division and colony formation in yeast. An unusual stretch of four histidine residues is found between the Yck2 amino-terminal kinase domain and membrane-targeting carboxyl-terminus. Because four adjacent bulky, charged histidines are quite unusual, we hypothesized that they play an important role in Yck2 function or localization. We therefore deleted the four histidine residues via site-directed mutagenesis using green fluorescent protein-tagged Yck2 (GFP-YCK2) as a template. After cloning the mutant gene in *E. coli* and confirming the mutation via sequencing, we ligated the mutant gene into a yeast/*E. coli* shuttle vector and expressed it in yeast. To assess function of the mutant gene, we used a Yck^s yeast strain, in which the chromosomal Yck2 allele functions at 24°C but not at 37°C. Introduction of wildtype YCK2 (our positive control) allowed these yeast to grow at 37°C, while introduction of an empty shuttle vector (our negative control) did not allow these yeast to grow at 37°C. We were then able to determine functionality of our mutant Yck2 by assessing growth at 37°C. Localization will be assessed by visualizing the GFP tag on our mutant Yck2 via fluorescence microscopy.

THE SHORT TERM EFFECTS OF CARBARYL
ON ADULT WOODHOUSE'S TOADS
(*BUFO WOODHOUSII*)

Lisa Yi Requena
Department of Biology
Centenary College of Louisiana

RESEARCH ADVISER

Dr. Beth Leuck

The global decline of amphibians has been attributed to numerous causes, but evidence suggests that pesticides are a growing contributor. Studies also suggest that multiple variables may interact and affect the toxicity of pesticides although biologists do not understand how the pesticides are making an impact. The majority of experiments that have included amphibians have only dealt with the larval stages, and few experiments have considered adult anurans, which explains why biologists are unclear about the effects of pesticides on them. In this experiment, I examined the short term effects of carbaryl, a globally common pesticide, on adult Woodhouse's toads (*Bufo woodhousii*) collected from Centenary's campus. Three groups of toads were subjected to three treatment conditions: control (0.00 mg carbaryl/L water), group one (0.50 mg/L) and group two (50.0 mg/L). Group one demonstrated a similar curve to the control group although the decreased slope indicated a decrease in metabolic activity. The CO₂ production curve for group two showed minimal CO₂ production implying that the toads' metabolism was greatly decreased. The data suggest that the concentration of carbaryl may be related to acetyl cholinesterase inhibition which impacts metabolic functions.

CONDITIONED TASTE AVERSION IN RATS

Jennifer Atchison
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Neuroscience Program
Centenary College of Louisiana

Research Adviser

Dr. Felipe Gomez

Taste aversion is the phenomenon that occurs when individuals become nauseas following ingestion of a given substance. Many times, nausea may not occur for hours, but should the individual become nauseated, it is likely he will pair his nausea with the substance he ingested earlier and develop a taste aversion to that substance, choosing in the future to no longer ingest it. Taste aversion can be established using a rat model, and the duration of time required to overcome a taste aversion can be tested.

In this experiment, I was interested in evaluating whether or not taste aversion developed if the rats were nauseated before they were presented with a sucrose solution versus after. Three male rats were first conditioned to drink water once a day for ten minutes on an established 24 hour time schedule. They were then given sucrose solution during the ten minute time period each day, and one was injected with 5.29mg/kg lithium chloride to induce nausea before given the sucrose solution, whereas the other was injected with 5.29mg/kg lithium chloride after it was given the sucrose solution. I then tested each rat for taste aversion by measuring how much sucrose solution they consumed during later presentations. I also evaluated how strongly conditioned they were by presenting the sweet water weeks later to evaluate if the taste aversion persisted.

INCREASES IN EXTRA CELLULAR CALCIUM
CONCENTRATION LEAD TO INCREASED
METABOLIC RATE IN *XENOPUS LAEVIS* LARVAE

Beth Thompson
Department of Biology
Centenary College of Louisiana

RESEARCH ADVISER

Dr. Beth Leuck

Changes in calcium concentrations in bodies of water can change rapidly due to anthropogenic factors such as concrete, deicer runoff, and fertilizer. The effects of increasing calcium concentration were measured in *Xenopus laevis* larvae by measuring the oxygen consumed/larvae/hour. The larvae exposed to higher calcium concentrations consumed more oxygen, corresponding to an increased metabolic rate. This is important because an increase in the metabolic rate indicates increased cellular activity. Calcium plays an important role on the cellular level. It can be used to signal mitosis or apoptosis. If the calcium concentration in a water source were to change dramatically, it could cause signaling errors on a cellular level. There has been a dramatic increase in deformities seen in amphibians in recent years. These deformities range from missing limbs to tumors. Though much research has been done examining possible causes of these deformities, to my knowledge, no one has examined the effects the aquatic calcium concentrations. These data indicate that increases in calcium concentration could be a possible cause of these malformations.

**DOES INSTABILITY OF A MUTANT YCK2 PROTEIN
REQUIRE Yck2 KINASE FUNCTION? THE EFFECT OF
A KINASE DOMAIN MUTATION IN AN UNSTABLE
Yck2 MUTANT**

Talicia Johnson and Cheynita Metoyer
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RESEARCH ADVISER

Dr. Lucy Robinson
Dr. Cynthia J. Brame

The yeast casein kinases (Yck1 and Yck2) are essential for cell division and ultimately cell survival and growth in yeast. Yck2 is characterized by a kinase domain and a carboxyl-terminus domain that is essential for protein localization and protein-protein interactions. Robinson and coworkers have previously characterized a mutant Yck2, termed $\Delta 1$ which lacks nine amino acids believed to encode an alpha-helix in the protein's carboxyl terminus. This mutant demonstrates dramatic instability. We hypothesize that this instability requires the kinase function of Yck2, perhaps because Yck2 $\Delta 1$ phosphorylates itself and thus targets itself for degradation. To test this hypothesis, we induced a mutation in the kinase domain of Yck2 $\Delta 1$ using site-directed mutagenesis. The mutant Yck2 was then transformed into *E. coli*, which amplified the mutant, and the mutant DNA was recovered by miniprep. An analytical digest was performed on the recovered DNA in order to determine if the YCK2-containing vector was isolated. Sanger-dideoxy sequencing was used to confirm that the desired mutation occurred. The mutant DNA was then cleaved and the GFP-tagged mutant YCK2 was ligated into a pGAL shuttle vector, which was again amplified into *E. coli*. The mYCK2-containing shuttle vector was then transformed into yeast for analysis.

Social Sciences

*Note: *Denotes presenter(s) for multi-author works.*

**IDEOLOGICAL FOUNDATIONS OF HEALTHCARE
INEQUALITY: A CROSS-CULTURAL CASE STUDY**

Diya Surie
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RESEARCH ADVISERS

Dr. Michelle Wolkomir
Dr. Cynthia Brame

This paper explores the ideologies that pervade the health-

care systems in two hospitals, one located in India and the other in The United States, to analyze how ideologies function to maintain healthcare inequalities in these hospitals. Data were collected primarily through fieldnotes of case locations and in-depth, loosely structured interviews with patients and healthcare professionals. Results indicate that, despite differences in culture and in systems of healthcare between the two cases, class ideology informed the ways in which the healthcare professionals approached their patients. This study highlights the importance of ideological beliefs as constraints towards creating more equitable systems of healthcare.

**THE ROLE GENDER PLAYS IN DOMESTIC VIOLENCE:
WHAT IS BEING DONE TO STOP IT?**

Megan LeBato
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Dr. Michelle Wolkomir

Traditional ideas about gender still permeate our society today. Although men and women now have similar rights and protections, greater privilege and power are still linked to masculinity. Given the pervasive and well documented trend that men commit domestic violence far more often than women, it is plausible to suggest that efforts to combat domestic violence should include working to change traditional gendered notions of offenders. To examine how gender is negotiated in efforts to decrease the occurrence of domestic violence, I analyzed an anger management program instituted by the courts to combat domestic violence. Often the solutions proposed to violent behaviors offered within the anger management classes incorporated gender in such a way that the solution was dependant upon the same gendered meanings that create the problem. Because of this dependence of gendered meanings the anger management classes ran the risk of perpetuating the cycle not diminishing it.

**OBSCURING SEXUAL HARASSMENT:
HOW GENDER STEREOTYPES
PERPETUATE HOSTILITY TOWARDS WOMEN**

Mary Noon
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Gender Studies Program
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RESEARCH ADVISER
Dr. Michelle Wolkomir

Research has shown that sexual harassment, though wide-

spread, is largely experienced by women. Despite such prevalence, sexual harassment is not viewed as a serious social problem. This study examines how and why traditional gender notions veil sexual harassment, making it appear normative. To explore the relationship between these gender notions and sexual harassment, data were collected by means of extensive research and twelve interviews with currently employed individuals. Interviews were tape-recorded, transcribed, and examined for patterns. Given the tendency to assume men cannot control their "hyper-sexuality" and that women must therefore do so, sexual harassment becomes seen as naturally-occurring and permanent. Implications for understanding how gender ideologies sustain power relations are also discussed in this study.

THE ADJUSTMENT OF EXPATRIATE FAMILIES

Emily Argue
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Centenary College of Louisiana

RESEARCH ADVISER

Dr. Kelly Weeks

As the business world grows larger and stronger, corporate America is sending more of their employee's families overseas. For the corporation to be successful they need their employee to finish their assignment while overseas. Studies have been performed to measure how well the spouse of the expatriate adjusts to the host culture. They concluded that training the spouse, along with the expatriate, better helped them adjust to the host culture and the assignment completed. This is better for the corporation because they have not lost time and money with an employee who failed. The focus of this study is on the children of expatriate and how their adjustment affects the family. We hypothesize that training the children of the expatriate will also lead to a successful completion of the assignment. By surveying each member of the family we are able to measure how each member of the family is affected by their family member's adjustment.

ETHICS IN ACCOUNTING

Jonathon Wright
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Dr. Barbara Davis

This paper discusses the ethical dilemmas we are facing in our accounting profession. In short, ethics is "a set of moral principles or values." This is a very tough area to regulate. Where is

the point that one person is wrong and the other is right? Just recently, we have seen many unethical decisions turn into very large problems (Enron, WorldCom . . .). This paper will discuss the reasons for these unethical decisions, what can or should be done to help eliminate these problems in the future, and what must be done to restore the public's trust in the accounting profession. This topic is not only important to the future of accountants, but to the future of our economy in general. We, as investors, put a lot of trust in knowing the financial statements of the companies we invest in are fairly stated. It is the responsibility of accountants, through auditing, to make sure these financial statements are not materially misstated.

THE ROLE OF RACE AND SOCIAL CLASS IN COMPENSATION DECISIONS

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Centenary College of Louisiana

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Dr. Kelly Weeks
Dr. Matthew Weeks

Previous psychological and sociological research has discussed the wage differentials between black and white employees for years. There are many theories explaining the gap in pay, and there are many articles examining when and why it may decrease. However, the fact remains that black men are paid less than white men overall. The purpose of this study is to look at the interaction between race and interpersonal judgments of social class on wage differentials and compensation decisions. For instance, does an individual's race or perceived socioeconomic status factor into what their offered base salary is or to what their raise associated with a promotion would be? In order to test these questions, we administered a survey with scenarios of working or middle class employees. Race and social class were counterbalanced, and participants were asked to make a series of decisions concerning the target's probable income and how much of a raise the target should receive during a promotion. Results indicated a significant interaction between race and perceived social class when predicting raise amounts.

UTILIZING STUDENT-MANAGED INVESTMENT FUNDS IN FINANCE EDUCATION

Scott Lerchie
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Centenary College of Louisiana

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Dr. Barbara Davis
Dr. Christopher Martin

A student managed investment fund (SMIF) allows undergraduate and/or graduate students to manage a real dollar portfolio usually taken from the school's endowment or from a designated gift. The fund is generally dependent upon convincing endowment administrators to allocate funds to be managed by students or finding a donor willing to make a designated donation specific to the student investment fund. Once the fund is established, students have the opportunity to apply theoretical concepts to real-world situations while enhancing their learning experiences and improving their finance education.

The purpose of this research is to investigate the use of student managed investment funds in the finance education process. A review of the literature is conducted to determine previously identified advantages and disadvantages of this learning tool. Schools utilizing SMIFs in their finance education are identified. Lawrence (1994) found 34 U.S. colleges and universities had incorporated SMIFs into their curriculum. Since that time, many additional educational institutions are reaping the benefits of utilizing SMIFs in their finance programs. This research will identify the location, size, and endowments of those schools with SMIFs. Returns from SMIFs will be investigated and compared to the returns of the college or university endowment.

MICRO-BANKING IN BANGLADESH

Thomas Scarlato
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Centenary College of Louisiana

RESEARCH ADVISER

Dr. Harold Christensen

Micro-banking is considered one of the most promising tools in the fight against global poverty. Intending to simply help the poor, Muhammad Yunus stumbled upon a business model that was not only socially beneficial but profitable as well. This business model has since become the Grameen bank, the largest private bank in Bangladesh. Micro-banking institutions leverage social capital (and hopes of a better life) to issue low risk loans to

thousands of people living on less than two dollars per day. By western standards, the loans are typically small and the interest rates are high. By Bengali standards, however, the interest rates are far below those charged by traditional money lenders and the loan amounts can be life changing. Opponents of micro-banking claim the marginally poor are being brought above the poverty line while the extremely poor are being largely neglected in the pursuit of higher profits and repayment rates. Ultimately, the high repayment rates, profit, and social benefit make it difficult to question the overall effectiveness of the micro banking business model.

DOWN THE RED CARPET TO A BOX OFFICE HIT

Emily Evans
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Centenary College of Louisiana

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Dr. Barbara Davis

The motion picture industry is very expensive and extremely risky. Investing in a film is a complicated process that requires sophisticated knowledge of investment vehicles, of the film industry, and of audiences. One must have the ability to put a group of people together with name recognition, proven talent, creative energy, and the will to get a project completed (Matthews, 1996). Studies have documented that stars have a positive impact on the success of a film (Rosen, 1981). Stars are valued by the public resulting in successful box office hits. Disney uses this “attractive concept” and markets their films generating considerable gross revenues for their corporation (Dekom, 1992).

Film production represents major investment with average production costs estimated at over ten million dollars (Smith, 1986). One purpose of this research is to investigate the impact of the film’s rating, distributorship, and Academy Award and Golden Globe award winning actors and directors on the film’s budget. The second purpose of the study is to evaluate the same variables’ impact on the gross revenues of the films. This study examined films released in at least one hundred theaters from the years 2002 to 2004. The film’s rating, distributor, whether an Academy Award winning actor was in the film, and whether more than one Golden Globe winning actor were in the film was significant for budgets and gross revenues.

COMPETING THEORIES ON THE ERADICATION OF POVERTY

Thomas Scarlato
Frost School of Business
Centenary College of Louisiana

RESEARCH ADVISER

Betsy Rankin

“The eradication of poverty is impossible.” Undeterred, several noted economists and large aid organizations have made exactly that their stated goal: to ensure that no person on earth has to live on less than two dollars per day. Despite this common goal, the various agencies and economists vary wildly on the pivotal questions of “how” and “how soon” this goal can be reached. The United Nations Development Programme intends to cut global poverty in half by 2010. Dr. Jeffery Sachs believes poverty can be eliminated altogether within a single generation. Economist Raymond Baker thinks Dr. Sachs’ strategy is absolutely wrong but agrees that poverty eradication is both possible and practical. Many more economists and aid agencies have faith that the free market will eventually put an end to global poverty without much need for outside assistance. This myriad of theories presents a single inescapable question: Can any of them actually work?

DOES READING STYLE AFFECT MEMORY RETENTION?

Sara Lehane
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Centenary College of Louisiana

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Dr. David Stafford

Reading and studying are common activities in any academic environment. But, do the methods one uses to study and read help memory retention? Does one remember more when reading silently or out loud? To determine if there is a relationship between reading style and memory retention, four groups of participants were asked to read a short story either silently or out loud and then asked to complete a short test immediately or 5 days after reading to determine a possible relationship.

EXAMINING AUTISM SPECTRUM DISORDER AS A COMMUNICATION DISORDER

Megan Vaughn Lerchie
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Centenary College of Louisiana

RESEARCH ADVISER

Dr. David Stafford

Autism Spectrum Disorder was first described in 1943. Since

then it has been classified as a neurodevelopmental disorder. The symptoms include repetitive behaviors, an abnormal response to sensation, and social and communication difficulties. Based on the author's personal experiences with autistic children and modern research of successful treatments of autism, this paper will propose that autism should be classified as a communication disorder. In this view, the social-communication deficits in autistic children are the underlying cause of other problems, such as poor academic performance. Current treatments of autism are analyzed to determine which aspects of each therapy target social-communicative development. The author proposes combining various aspects of treatments to enhance social and communication skills.

**WHY SOME THINK THEY CAN AND OTHERS THINK
THEY CAN'T: ACHIEVEMENT MOTIVATION
IN AMERICA'S SCHOOLS**

Ashlie Junot
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Centenary College of Louisiana

RESEARCH ADVISER
Dr. David Stafford

In this study researchers examine the basic concepts of motivation – rewards, incentives, goals, effort, competence, source of motive, and fear. After surveying the theoretical basis for what moves an individual into action, researchers apply these concepts to the current education system in America. What motivates students? What motivates teachers? Are we running schools in a way that maximizes students' intrinsic motivation? Finally, this study explores alternative methods of teaching that may be more congruent with the basis of motivational theory. Are there other styles of teaching that would appeal to students more than lecture does? Do these alternatives present more opportunity to tap into students' achievement motivation? This study investigates what are the best methods for instilling lasting motivation in students so that they can continue through school with a drive to succeed.

IRAQ: A PRESCRIPTION FOR CRISIS

Ryan Goodwin
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Centenary College of Louisiana

RESEARCH ADVISER
Dr. Philip Barker

Today it is impossible to read the newspaper or turn on the

television and not hear about Iraq. It is the source of constant debate not only throughout Washington, but also at water coolers around the United States. At first the debate was centralized around the idea that an invasion of Iraq was necessary for the protection of U.S. interests because of the imminent threat of weapons of mass destruction and Saddam Hussein's willingness to use them. Since the invasion, the debate has refocused on the ambiguity of our current mission in Iraq. Everyday we hear about American soldiers dying, but we are not ever exposed to the successes in Iraq which justify these deaths. During the war there were clearly defined objectives, find the weapons of mass destruction, force the armies of Iraq to surrender, and capture Saddam Hussein. Now that there are no clearly defined objectives, a once popular war is beginning to lose political steam. The current strategy in Iraq is creating and following a timetable that leads to our eventual withdrawal from the region. The important question here is what we should do in Iraq and what policies would benefit the people of Iraq the most.

HOW WILL THE FUTURE STATUS OF KOSOVO AFFECT EUROPEAN INTEGRATION AND STABILITY?

Eftim Stojanov
Department of Political Science
Centenary College of Louisiana

RESEARCH ADVISER
Dr. Philip Barker

The goal of this paper is to analyze the recent developments in the Balkan region and examine how the future status of Kosovo will affect European integration and stability. In short, the author argues that the more the international community prolongs Kosovo's final status, the worse the impact on European integration and stability of the Balkan region and the security of Europe as a whole. Moreover, after the EU pledged to accept Romania, Bulgaria, and possibly Croatia, in 2007, it can no longer ignore the Western Balkans. By ignoring the Western Balkan countries, the EU runs the risk of creating a black hole that can seriously harm the European project in the future.¹

The view of the author is that Kosovo, and the Balkans as a whole, need to be immersed as soon as possible under Europe's economic blanket by giving Kosovo conditional independence with realistic prospects of European integration. This research stands as a single case interpretive study with an analytical framework resting on the constructivist/idealist approach to international relations theory. The author also utilizes Allen Buchanan's theory of secessionist movements and the neofunctionalist approach to European integration to further understand Kosovo's plight.

¹The International Commission on the Balkans, "The Balkans in Europe's Future," [database online] accessed April 20, 2005; available at: www.balkan-commission.org

HUMANITIES

*Note: *Denotes presenter(s) for multi-author works.*

GENDER AND THE MULTICULTURAL SELF: TRANSLATING IDENTITY IN JHUMPA LAHIRI'S *INTERPRETER OF MALADIES*

Amy Larson
Department of English
Centenary College of Louisiana

RESEARCH ADVISER

Dr. Kimberly Vanhoosier-Carey

In my honors project, I explore the notion of identity in the work of second generation American writers. Jhumpa Lahiri's short stories in *Interpreter of Maladies* (1999), for example, depict the experience of Indian-Americans from multiple perspectives, but with a common theme of struggling to define oneself by translating values and practices that conflict with the dominant American culture. The title story is about a second generation couple on vacation in India; despite their heritage, they are merely tourists. In such stories, Lahiri uses photographs and mirrors to explore identity. In this case the family photograph reveals the artificiality of gender roles, specifically that of a wife and mother. Both photographs and gender roles are presentations through which an individual and a family communicate their stability by following the conventions. Just as people automatically stop smiling and take a step or two away from each other after the shutter clicks, it is also impossible to continually fulfill all the duties of one's gender role. However, Mrs. Das defines herself by her ability to perform this role, and through the course of the story we see how complicated this is.

CONSTRUCTING A FAMILY: DR. JAMES DOBSON'S CHRISTIAN PRINCIPLES OF RELIGION, POLITICS, AND GENDER ROLES IN THE AMERICAN FAMILY

Kacie Lopez
Department of Religious Studies
Centenary College of Louisiana

RESEARCH ADVISER

Dr. David Otto

Family counselor Dr. James C. Dobson leads America's advocates for Christian principles and maintaining the traditional family structure. His Biblically-based advice on Christian family

life has earned great public support, and has created a political arena for the family values agenda in the form of his organization, *Focus on the Family*. This paper examines Dr. Dobson's highly-acclaimed family methodologies with attention to Dr. Dobson's insistence on traditional gender roles within the conventional family structure, and his claim that they are crucial to the effective functions of the family, despite opposing evidence that modern families require gender roles with more flexibility.

Section Two reviews the literature on Dr. Dobson and other family experts, with attention to Dr. Dobson's advice regarding families concerned with adhering to religious principles in a society with shifting social values. Section Three discusses the use of historiography as an effective research method for the project.

This project establishes that Dr. Dobson perceives traditional family and gender roles as essential to preserving American religion, politics, and family. In a society whose attitudes appear more avant-garde than ever before, Dr. Dobson pleads for conservative citizens to take action against non-Biblical family structures through the arenas of political, socially, and personal activism.

THE EVOLUTION OF INTELLIGENT DESIGN

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The Intelligent Design movement purposes that a rational creator exists and controls organisms and complexities in the world. In recent years, a group of conservative Christian Evangelical Protestant intellectuals, dissatisfied with the record of Creationism, have reconstructed the debate arguing for the existence of an Intelligent Designer. Although research exists on the Intelligent Design movement, no comprehensive text exists that traces the history of the movement. This paper focuses on the changes made in the movement through the research of primary and secondary texts and what that implies for the movement itself.

Section two reviews the literature on the subject. Section three analyzes the research method used, historiography. Section four examines the changes of the movement over time.

The Intelligent Design movement contains three major elements that interplay to create a dialogue between advocates and the opposition. The movement originally began as *a set of religious convictions* but soon attempted to develop a *scientific element* to reinforce its statements about how the world works. The movement also used *politics* to increase its following and gain

support for Intelligent Design. All the changes and adaptations attempt to gain status and legitimacy in the scientific and public sphere.

**BENEATH A BLACK MESSIAH:
THE THEODICY OF MARTIN LUTHER KING, JR.**

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The primary and secondary works by Martin Luther King, Jr. and about his thought provide an impressive amount of information on the various areas of his theology. Despite the valuable work done on King, what lacks in King studies is the systematic treatment of King's theodicy, or his explanation of suffering in light of the existence of God. This paper will explore the claim that King's theodicy rests within his Black Messianic Vision.

Section one introduces and states the problem, outlines the purpose and importance of the study, raises important resource questions, and defines crucial terms. Section two explores four critical aspects of King's theology: Nature of God, Nature of Humanity, Nature of Jesus Christ, and Nature of Sin and Evil. Section three examines the research method of the study while Section four reconstructs King's theodicy, revealing a surprising counter-claim. Finally, section five will raise implications of further study.

**'UNNATURAL' SEX:
A CULTURAL EXPLORATION
OF PAUL'S TEXT**

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Many Christians recognize Paul of Tarsus as a predominate figure of early Christianity. Today Paul's writings serve as spiritual guidelines for most Christians, especially in attempts to answer questions pertaining to the morality of homosexuality. After exploring the work of several scholars performing Biblical exegesis on Romans 1:26-27, this paper asks the question: is it possible to interpret Paul's text beyond its traditional understanding? In order to answer this question, this paper explores the social and

political context of first century Rome. In examining these contexts, questions of heterosexist ideals emerge. Thus, this project applies a queer reading to the text as a method of interpretation, in order to yield a socially liberated meaning.

Section two reviews literature on the subject and is divided into the following sub-sections: Greek concepts of homosexuality, Roman concepts of homosexuality, definition of Biblical language, and interpretation. Section three explains the research methodology of the project. Section four reveals how a traditional reading of Paul's text often yields a negative and even sinful view of the homosexual. This section also demonstrates how to apply a queer reading to the text as a different method of interpretation.

Ultimately, this project demonstrates the benefits of a non-traditional interpretation of Paul's text. Instead of examining Paul's text for moral value, this paper demonstrates methodology of interpretation and raises questions about the text, beyond its ability to dictate right or wrong.

TEA: THE BAROMETER OF JAPAN

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Tea is a global phenomenon and has found many cultural niches to call its own. Throughout the history of tea few cultures have ever exalted it like the Japanese. Among the Japanese tea became the cultural symbol of the bakufu, shogun, samurai, and even monk. Tea spread through all spheres of wealth, religion, and culture and eventually became the "Way of Tea," the aesthetic mode of life that is unique to Japan. It is the intention of this study to map the broad development of not only tea but Japan as a whole through the span of almost a thousand years. Tea will be the cultural barometer during this historical journey.

Section one explores the medieval period and how tea came to Japan as well as its cultural parent, Zen. Section two covers the early modern period where tea grew into an institution of political power. Section three uncovers the cultural assault endured by, not only tea, but all Japanese life during the Meiji restoration. Finally, section four shows how traditional Japanese life and tea has recovered and explores the possible future of the "Way of Tea" on a global level.

**A NEW KIND OF THEOLOGIAN: CONVERSATIONAL
THEOLOGY IN BRIAN McLAREN'S
A NEW KIND OF CHRISTIAN TRILOGY**

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In the 21st century, Christianity faces a crisis of relevance. The cultural phenomenon often termed *postmodernity* challenges Christianity to reconsider and sometimes reinvent traditional faith doctrines. While many moderate and liberal theologians have taken up this task, few contemporary evangelical/conservative thinkers have attempted to adequately address postmodernity's problems and possibilities. My research paper focuses on Brian McLaren's *A New Kind of Christian* trilogy, which represents a novel approach to postmodern evangelical/conservative theology.

Section Two reviews McLaren's works. Section Three outlines the use of discourse analysis as a tool to examine the trilogy's writing style. Section Four applies the method to the text, highlighting certain definitive rhetorical patterns. Through these patterns, McLaren sets forth a model for mutually-forming relationships in which conversation leads to mutual transformative insight and experience, providing a fresh perspective on traditional Christian ideas. The model not only invites readers into the text but also equips them to begin similar conversations with other believers. With a new perspective, transformed through relationship and shared experience, conservative Christians can once again address their culture effectively as "a new kind of Christian."

NATURAL SCIENCES

*Note: *Denotes presenter(s) for multi-author works*

**OPTOMETRIC AUTOMATION:
DIGITALLY QUANTIFYING SEGMENT HEIGHT
AND PUPIL DISTANCE**

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Segment height (SH) and pupil distance (PD) are two opto-

metric measurements used for bifocal and frame personalization. SH is the height of the line with respect to the lowest point of a bifocal lens where the two prescriptions for reading and distance meet. PD is the distance between the centers of the two pupils. These measurements are taken with manual tools and recorded manually for each patient. We are proposing a computerized method to record SH and PD to increase the accuracy and ease of these currently manual procedures.

We modified a webcam to capture images of a person's eyes from a comfortable distance. Using the NIH imaging software ImageJ, we are able to draw SH and PD lines on the image. ImageJ can then measure and record these lines in terms of millimeters, since it allows the user to set an absolute distance scale.

At present, this engineering project will require developing an ergonomic design, improving user-friendliness, and optimizing lighting conditions. Supplementary research will determine the possible usefulness of pattern recognition and infrared imaging. However, the aims of the final product could ultimately have implications in online frame shopping, online contact shopping, and increased quality of fitting lenses, frames, and contacts.

AUTOMATION OF AN APPARATUS USING VISUAL BASIC: TAKE TWO

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The goal of this project was to continue the development of a computer program written last year that was designed to automate the motors, electronic valves, and heaters of a research apparatus currently under construction in the Physics department. The program was to be upgraded to give the user the ability to control each element of the apparatus separately and the ability to change and save his or her work. This was accomplished by writing the program to create a random access file when the program is opened that is then used to manage a series of time events, including the duration and motion of the motors, and the activation/deactivation of the valves and heaters. Multiple files can be opened and saved within the program to meet the needs of the user. The program was also updated to run on Windows XP rather than Windows 98. Another goal of the project was to design and build the circuitry that interfaces the valves and heaters to two parallel ports in a computer. Design principles of this circuit diagram will also be discussed.

ENHANCEMENT OF GRIESS ASSAY USING A LIQUID WAVEGUIDE CAPILLARY CELL

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Nitrite is a stable product of nitric oxide synthesis that is often assessed as a marker of immunological, cardiovascular, or neuronal activity. A simple and inexpensive colorimetric assay for quantifying this product in biological fluids is the Griess Reagent. A significant drawback of this method is its low sensitivity, which is at best marginal to measure basal levels of this anion in plasma. Here we explore the use of a 1-meter liquid waveguide capillary cell over conventional 1-cm cuvettes as a means to enhance the sensitivity of the assay. Preliminary experiments suggest that a 10-fold enhancement of is readily achieved when this added hardware is combined with a modified assay protocol. Our results indicate that a decrease in the amount of Griess reagent as well as an increase in incubation time leads to this improvement.

STUDIES ON CHITIN DEACETYLASE

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Chitin, the β -1,4-polymer of N-acetyl-D-glucosamine, is the second most abundant polymer, after cellulose. However, working with chitin is difficult, as it is insoluble in aqueous solution. By converting it through deacetylation, the product, "chitosan" becomes soluble when protonated in solution of pH 6. The free amine group is also a good nucleophile, so its side chains can be used to tailor properties like viscosity. While this process has been carried out industrially for some time, it produces large amounts of caustic waste for small amounts of usable product.

Some are interested in developing a "Green Chemistry" alternative. Bacteria such as *Bacillus cereus* secrete chitin deacetylase (CDA) into their surrounding environment. There are several inherent issues with developing such a process. First, chitin is insoluble. The reaction being investigated is coupled to a series of reactions that are monitored using spectrometry methods. Lastly,

Bacillus cereus also secretes aggressive proteases that destroy CDA within 24 hours. While much was accomplished, the goal of isolating and studying CDA was not, due to difficulties in inhibiting the proteases and creating a medium for the bacteria that lacked acetate, the product to which the enzyme assay was coupled in order to monitor the deacetylation process.

PHYLOGENETIC IMPLICATIONS OF
NUCLEAR SEQUENCE VARIATION
IN THE *PEROMYSCUS MANICULATUS*
SPECIES GROUP

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Prior research evaluated the specific validity and phylogeographic origin of *Peromyscus sejugis*. The authors concluded that *P. sejugis* is an insular isolate of *P. maniculatus* from Baja California because of a low level of sequence divergence between these populations in the ND3/ND4L/ND4 mitochondrial DNA region. These data supported the assertion that *P. maniculatus* is polyphyletic. Further, the study confirmed the unresolved sister-group relationship between *P. maniculatus*, *P. sejugis* and *P. keeni*. To test the validity of using the USP marker, we compared sequence phylogenies derived from an X-chromosome marker (USP) to the ND3/ND4L/ND4 phylogenies for *P. maniculatus* from Baja and California. We first generated a USP-derived phylogenetic tree and compared it to the known phylogeny for the *P. maniculatus* species group. As we obtained the corroborated phylogeny, we then assessed the level of variation in the USP gene for the *P. maniculatus* species group and *P. leucopus* to determine whether this marker resolved the *P. maniculatus*/*P. sejugis*/*P. keeni* trichotomy. Since the USP marker yielded low levels of both intra- and interspecific variation, it was ineffective in resolving the trichotomy; however, it did cluster the *P. maniculatus* from Baja and California as separate from other *P. maniculatus* populations, thus confirming the apparent polyphyletic nature of *P. maniculatus*.

THE EFFECTS OF A SUGARCANE PESTICIDE COCKTAIL ON THE METABOLISM OF LUMBRICUS TERRESTRIS

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Few experiments focusing on the effects of chemical cocktails, a combination of chemicals, have been performed. In this experiment I looked at the effects of a sugarcane pesticide cocktail on the metabolism of earthworms (*Lumbricus terrestris*). Earthworms respire cutaneously making them suitable bioindicators of chemical contamination of the soil. The cocktail was a combination of an herbicide, Roundup, and an insecticide, Triazicide. Both are commonly used on sugarcane in south Louisiana as post-emergence pesticides. I determined the rate of metabolism by measuring the amount of carbon dioxide produced by the earthworms when exposed to the chemicals for six hours. I expected no change in earthworm metabolism in the presence of the chemical cocktail. I found that earthworm metabolism did not change significantly for the worms exposed to the individual pesticides when compared to the control. However, the chemical cocktail significantly lowered carbon dioxide production compared to the other three conditions ($p = 0.01$).

THE EFFECT OF PARAQUAT POISONING ON THE GREEN ANOLE (*ANOLIS CAROLINENSIS*)

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Green anoles (*Anolis carolinensis*) are native to the south-east United States. Paraquat is a pesticide widely used by commercial agricultural producers to limit the growth of unwanted plant invaders. Because of its wide-scale use, many organisms that live in these warm, moist areas may come into contact with paraquat on a fairly frequent basis. In this experiment, anoles were placed in 1 of 3 containers – a control (no paraquat), one where the food was saturated with paraquat (in the form of Gramoxone), and another into which paraquat at field concentration was misted. Carbon dioxide levels were measured four times an hour for 24 hours using Vernier Software Carbon Dioxide Sensors. The three male anoles (one from each container) were dissected to

determine any physical effects. Upon analysis of data and dissection, it was determined that paraquat, in the form of Gramoxone, had a substantial effect on the anoles. Effects ranged from decreased carbon dioxide production to liver deformities to death, especially in those anoles misted with the chemical.

DENDRITIC CELL-BASED GENETIC IMMUNOTHERAPY FOR PROSTATE CANCER

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Our goal was to improve upon dendritic cell (DC) vaccination with tumor antigens by delivering prostate specific membrane antigen (PSMA) via a CD40-targeted adenoviral (Ad) vector expressing PSMA directly to DCs *in situ* as an efficient means for activation and antigen presentation to T-cells. We initially developed a mouse model of prostate cancer that expressed high levels of human PSMA. We then tested the efficacy of the CD40-targeted Ad-PSMA vector to stimulate a cytotoxic T-cell (CTL) response *in vivo*. Using RM-1-PSMA cells pretreated with IFN-g as target cells, we demonstrated that DCs infected *ex vivo* with Ad-PSMA, as well as those infected by direct intraperitoneal injection of the CD40-targeted Ad-PSMA resulted in high levels of tumor-specific CTL responses, compared to responses with a control adenovirus (Ad-luc1). Thus, we have demonstrated that direct immunization of DCs *in situ* with a CD40-targeted Ad together with IFN-g treatment of target cells is effective in inducing an antigen-specific CTL response to PSMA. We have initiated animal studies to test the efficacy of the CD40-targeted PSMA vector versus a non-targeted vector with and without stimulation by IFN-g in protecting against a lethal RM-1-PSMA tumor challenge. At day 14 post-tumor inoculation, only those animals treated with the CD40-targeted adenovirus and IFN-g were resistant to challenge with RM-1-PSMA tumor cells.

THE EFFECT OF AGRICULTURAL PESTICIDES ON NATIVE AND FARM-REARED EARTHWORMS

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Earthworms play an important role in the conversion of plant litter into rich soil that is beneficial for plant growth. They can do this by improving aeration and permeability of the soil. Agricultural pesticides are widely used to ensure a higher quality product from farms by ridding the soil of unwanted flora and fauna. However, many times these pesticides have adverse effects on other organisms living in that soil. One of these organisms is the earthworm. In this experiment, a group of native earthworms and European earthworms reared on a worm farm were put either into a control soil medium free of pesticides, a soil with two pesticides, or a soil with three pesticides. Carbon dioxide levels were measured four times an hour for 48 hours using Vernier Software Carbon Dioxide Sensors. Different species of earthworms may respond differently to the pesticides based on their previous exposure to them.

MEMBRANE LOCALIZATION OF YEAST CASEIN KINASE 2 BY PALMITOYLATION: DOES DISTANCE FROM THE CARBOXYL TERMINUS MATTER?

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Yeast casein kinase 2 (Yck2) is a member of the casein kinase 1 family of protein kinases. This kinase family has been conserved throughout evolution and is important for several events in cytokinesis, such as bud and septin ring formation. Previous experiments have demonstrated that membrane localization is essential for full Yck2 function. Furthermore, two cysteines at the carboxyl-terminus mediate membrane localization. Although mutation of either of these cysteines reduces Yck2 membrane localization and function, mutation of the two cysteines individually results in distinct phenotypes. To investigate whether the distinct phenotypes arise from the distance of the cysteine from the carboxyl-terminus of the protein, we sought to delete the

final cysteine. Specifically, our experiment introduced a point mutation that deleted the C-terminal cysteine residue by converting the cysteine codon to a stop codon. To introduce the mutation, we performed site-directed mutagenesis using a green fluorescent protein-tagged Yck2 as template. We then cloned the GFP-mutantYCK2 (GFP-mYCK2) gene in *E. coli*. After performing Sanger dideoxy sequencing to confirm that the desired mutation had been introduced, we transferred the GFP-mYCK2 to a yeast/*E. coli* shuttle vector and expressed it in yeast to investigate function and localization of the mutant Yck2 protein.

THE EFFECT OF A CARBOXYL-TERMINAL MUTATION YEAST CASEIN KINASE 2 FUNCTION AND LOCALIZATION

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Yck2 (yeast casein kinase 2) is a member of the casein kinase 1 family of protein kinases. Yck2 and Yck1, its homolog, are essential for cell division in yeast. Strains of yeast containing one or the other survive and grow, but strains lacking both do not complete cell division. Yck2's amino-terminal end displays kinase activity, and its carboxyl-terminal end targets Yck2 to the plasma membrane. Our experiment sought to investigate the effects of a deletion of 51 bp/17 amino acid C-terminal sequence that is shared with Yck1. The carboxyl-termini of both Yck1 and Yck2 targets the proteins to the membrane. Furthermore, there is little sequence similarity between the two proteins C-termini except for the region deleted in this case. The goal of the experiment is therefore to determine whether this sequence is required for the targeting of the proteins to the membrane. We used site-directed mutagenesis to introduce the desired deletion into a GFP-tagged Yck2. We then cloned the mutant Yck2 in *E. coli*, verified the mutation by Sanger dideoxy sequencing, and transferred the mutant gene to a shuttle vector for expression in yeast. Initial analyses will investigate function of the mutant Yck2, while later analyses will investigate localization.

THE EFFECTS OF THE CONVERSION OF A LYSINE TO AN
ARGININE IN THE CATALYTIC SITE OF YCK2
IN *SACCHAROMYCES CEREVISIAE*

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Yeast casein kinase 2 (YCK2) is essential for cell division in yeast. A defect in this gene causes the yeast to be unable to divide, preventing colony growth. We have investigated whether a change in the catalytic site of Yck2 — specifically, the conversion of a lysine to an arginine — will act as a lethal mutation. The mutation was induced by site-directed mutagenesis. The mutant YCK2 allele was cloned in *E. coli*, and the mutation verified by Sanger dideoxy sequencing. The mutant YCK2 allele was then transferred to a shuttle vector, amplified in *E. coli*, and expressed in a Yck^{ts} strain of yeast, in which the chromosomal Yck2 allele is nonfunctional at 37°C. The ability of the mutant YCK2 allele to complement the temperature-sensitive allele was assessed to determine the functionality of the mutant.

ROLE OF *VIBRIO CHOLERAE* CHEA, W,
AND Y PROTEINS IN CHEMOTAXIS

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Vibrio cholerae is a motile gram negative bacterium that is the causative agent of ~5-7 million cases of cholera worldwide each year. *V. cholerae* colonizes the gut and secretes the cholera toxin in small intestine, which can lead to severe dehydration and death. *V. cholerae* pathogenicity requires the bacterium to demonstrate directed chemotaxis, or movement toward a diffusible attractant. Chemotactic genes, such as *cheA1*, *A2*, and *A3*, play a role in controlling the rotation of flagella, resulting in directed chemotaxis. *Che W1* and *Y3* interact with the dominant *che A* homologue. In order to understand the role of various CheA proteins in *V. cholerae*, we generated insertion mutations in *cheA1*, *A2*, *A3* genes through allelic exchange. We generated deletion mutants in *cheW1* and *Y3* genes. The Δ *cheA* mutant strains

Δ

were characterized using cholera toxin assays, chemotaxis assays, and *in vivo* colonization using an infant mouse model. We saw no difference between wildtype and Δ CheA1 and Δ A3 mutants. The Δ CheA2 mutant strain, however, showed a marked reduction in chemotactic activity and also out-competed the wild type strain in *in vivo* colonization assays. These data suggest that CheA2 is the dominant CheA homologue involved in chemotaxis signal transduction pathway. Previous studies have shown CheW1 and CheY3 to be the dominant homologues of the CheW and CheY proteins. Decreased chemotactic ability similar to that seen in Δ CheA2 was noted in the Δ CheW1 and Δ CheY3 mutants.

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